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10/791,383	03/03/2004	Atsuhiro Takata	Q80143	3486

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EXAMINER	
ROSSI, JESSICA	

ART UNIT	PAPER NUMBER
1733	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/791,383	Applicant(s) TAKATA ET AL.
	Examiner Jessica L. Rossi	Art Unit 1733

V

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 7/7/06, Response.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-3 is/are pending in the application.

4a) Of the above claim(s) 3 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1 and 2 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☒ Other: See Continuation Sheet.

Continuation of Attachment(s) 6). Other: online translation of JP 10-330520.

DETAILED ACTION

Election/Restrictions

1. Applicant's election **without traverse** of Group I, claims 1-2, in the reply filed on 7/7/06 is acknowledged.

Response to Remarks

2. The rejection of claims 1-2 under 35 USC 103(a) as being obvious over McAmish et al. in view of Hutson et al., as set forth in paragraph 7 of the previous action, has been withdrawn in light of Applicant's arguments presented in the first two paragraphs on p. 4.

3. The rejection of claims 1-2 under 35 USC 103(a) as being obvious over McAmish et al. in and Hutson et al. and further in view of Takata et al., as set forth in paragraph 8 of the previous action, has been withdrawn in light of Applicant's arguments presented in the first two paragraphs on p. 4.

4. The rejection of claims 1-2 under 35 USC 103(a) as being obvious over McAmish et al. and Hutson et al. and further in view of Sugimoto et al., as set forth in paragraph 9 of the previous action, has been withdrawn in light of Applicant's arguments presented in the first two paragraphs on p. 4.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. <u>Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over McAmish et al. (US 6811643, of record) in view of Sugimoto et al. (US 4472328, of record) and further in view of Soji et al. (JP 10-330520, listed in IDS, on-line translation attached to present office</u>

action), or alternatively, Soji et al. in view of McAmish et al. and further in view of Sugimoto et al.

With respect to claim 1, McAmish teaches a method for making a laminated porous polyolefin film (12) by providing a pair of tools (could be those rollers represented by reference numbers 24, 25 and/or other tools not shown, such as hot plates – see column 6, lines 7-50) for thermocompression bonding two resin films (co-extruded or pre-formed films; column 6, lines 40-45 and then lines 23-27) between the pair of tools (Figure 1; column 7, lines 1-24), laminating two films (column 4, lines 51-60; column 6, lines 23-45) each comprising at least one layer made of a polyolefin resin composition comprising 38-55% by weight of a polyolefin resin and 40-60% by weight of pore-initiating filler (column 6, lines 51-54; column 10, lines 40-45; column 5, lines 44-51) to form a laminated film by piling and bonding the films between the pair of tools, and drawing the laminated film to form micropores therein (Figure 1; column 3, lines 1-10; column 6, lines 47-50; column 7, lines 29-31).

McAmish teaches a large range of resin and filler to be used in the films and one would appreciate that these weight ranges translate into parts by weight ranges that satisfy at least a portion of those ranges being claimed by Applicant.

It is unclear as to the melt index of the polyolefin resin. It is known in the art to produce a porous polyolefin film, which comprises 100 parts by weight of polyolefin resin and 25-400 parts by weight of a filler such as calcium carbonate (one would appreciate this to be a pore-initiating filler based on the teaching of McAmish at column 5, lines 44-50 and column 10, lines 44-46) and which also has a melt index of 0.1 g/10 min, wherein the film is rendered porous by stretching, as taught by Sugimoto (abstract; column 1, lines 50-57; column 2, lines 10-20;

column 2, lines 29-31). Sugimoto uses a polyolefin resin having such a melt index because it exhibits good extrudability and producibility (column 2, lines 16-20).

Therefore, it would have been obvious to use a polyolefin resin having a melt index that falls within Applicant's claimed range (i.e. 0.1 g/10 min) because such is known in the art as a resin that exhibits good extrudability and producibility, as taught by Sugimoto.

It is unclear as to whether McAmish teaches the surface temperature of each tool being adjusted to a temperature higher than the melting point of the polyolefin resin by from 5-25°C during lamination.

It is known in the art to make a laminated porous polyolefin film by thermocompression bonding at least two polyolefin resin films, which can be the same or different resin films and which can be co-extruded or pre-formed films, between a pair of thermocompression bonding tools, such as heated rollers or heated plates, and then stretching the laminate to render it porous, as taught by Soji (abstract; on-line translation, sections [0007, 0011, 0016, 0017, 0019, 0026, 0028, 0041]). Soji teaches the surface temperatures of the tools being adjusted to a temperature within the range of +/- 20°C the melting point of the resin that has the lowest melting point so that the temperature will be high enough to produce an adequate bond between the films while not being too high so as to adversely affect the formation of pores during the stretching step (abstract; sections [0010, 0024]).

Therefore, it would have been obvious to have the tools of McAmish each have a temperature that is higher than the melting point of the polyolefin resin by a number of degrees that falls within Applicant's claimed range because such is known in the art, as taught by Soji, where such a temperature will be high enough to produce an adequate bond between the films

while not being too high so as to adversely affect the formation of pores during the stretching step.

Alternatively, with respect to claim 1, it would have been obvious to use a polyolefin resin comprising 100 parts by weight of polyolefin resin and 80-300 parts by weight of a filler, such as calcium carbonate, for the polyolefin resin of Soji because such is known in the art, as taught by McAmish, for facilitating the formation of pores during a post-laminating stretching step (column 5, lines 44-50; column 3, lines 28-36; column 10, lines 40-50). Furthermore, it would have been obvious to use a polyolefin resin having a melt index that falls within Applicant's claimed range (i.e. 0.1 g/10 min) for the polyolefin resin of Soji because such is known in the art as a resin that exhibits good extrudability and producibility, as taught by Sugimoto (column 2, lines 10-20).

Also regarding claim 1, if it is not taken that the percent by weight ranges given by McAmish translate into the parts by weight ranges claimed by Applicant, such would have been obvious in light of the teachings of Sugimoto (teaches 100 parts by weight polyolefin resin, 25-400 parts by weight filler – see above for complete discussion).

Regarding claim 2, McAmish et al. discloses a resin containing greater than 10% by weight of polyolefin resin, but it is unclear as to the molecular chain length of the resin. Selection of a molecular chain length of the polyolefin resin would have been within purview of one having ordinary skill in the art depending on the desired properties of the resin.

7. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being obvious over McAmish et al., Sugimoto et al. and Soji et al., or alternatively, Soji et al., McAmish et al. and Sugimoto et al. as applied to claim 1 above and further in view of Takata et al. (US 6884836, of record).

The applied reference has a common inventor and assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

With respect to claim 1, if it is not taken that the percent by weight ranges given by McAmish translate into the parts by weight ranges claimed by Applicant, it would have been within purview of the skilled artisan to use a resin film having 100 parts by weight of polyolefin resin and 80 to 300 parts by weight of filler for that of McAmish because such is known in the art as taught by Takata (column 1, lines 42-49).

Regarding claim 2, McAmish et al. discloses a resin containing greater than 10% by weight of polyolefin resin, but is unclear as to the molecular chain length of the resin. It would have been obvious to use a polyolefin resin having a molecular chain length of 2850 nm or more because such is known in the art, as taught by Takata (column 1, lines 43-44).

Response to Arguments

8. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Jessica L. Rossi** whose telephone number is **571-272-1223**. The examiner can normally be reached on M-F (8:00-5:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard D. Crispino can be reached on 571-272-1226. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JESSICA ROSSI
PRIMARY EXAMINER

JP 10-330520

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of the porosity film used for the separator for a demarcation membrane, a breathable film, and cells etc.
[0002]
[Description of the Prior Art] It is known for the monolayer by carrying out the laminating of the porosity film that the function which cannot be demonstrated can be granted. Although the place made into the purpose is various, reinforcement of the porosity film by acquiring the unsymmetrical structure excellent in permeability and carrying out the laminating of the porosity film with which reinforcement differs, prevention of the pinhole (big and rough hole used as a defect) by the laminating of a porosity film of the same kind, the adhesive improvement by the laminating of the porosity film with which surface properties differ, etc. are main by carrying out the laminating of the porosity film with which apertures differ.
[0003] The porosity film generally obtained by uniaxial stretching tends to split in the extension direction, and is thrust into it, and many proposals are made about amelioration of mechanical strengths including reinforcement.
[0004] In JP,49-130978,A, to the adhesion side of this film, it applied completely and partial spreading or the approach of sticking so that the direction of orientation of this film may next be crossed is proposed [at least two or more sheets of the porosity nature crystalline polymer film by which orientation was carried out to 1 shaft orientations] for a binder or adhesives. Moreover, in this official report, as the laminating approach, corona discharge was performed to the contact surface of this film, and after piling up so that the direction of orientation may cross, the approach of carrying out thermocompression bonding is also collectively proposed with the temperature below the melting point of this film.
[0005] In JP,63-72063,A, the nonaqueous electrolyte cell characterized by being the laminating sheet which carried out the laminating of the porosity film of two or more sheets as a separator so that each extension directions might differ is proposed.
[0006] In JP,8-236098,A, the 1st [which has an anisotropy about a mechanical strength], and 2nd microporous polymer layers were prepared, the orientation of the 1st layer was made to cross to the orientation of the 2nd layer by subsequently cutting the 1st layer spirally at least, and the dc-battery separator manufactured by the manufacture approach of a crossover layer dc-battery separator and this manufacture approach of pasting up the 1st and 2nd layers in the shape of field contact further is proposed.
[0007]
[Problem(s) to be Solved by the Invention] Since each above-mentioned conventional technique was the approach of carrying out a laminating after producing a porosity film, the hole was blockaded at the time of a laminating and it had the trouble that the adhesive property and porosity between layers were incompatible. That is, since the adhesive strength between sufficient layers was not obtained even if it

carries out thermocompression bonding at the temperature which a hole does not blockade, sufficient effectiveness -- each class splits independently at the time of use -- was not acquired. Moreover, it has the constraint (for example, the adhesives at the time of use itself or elution of a minor constituent) by the approach of carrying out laminating unification with adhesives being a material with which the adhesives other than a problem with which adhesives permeate a hole differ from this film.

[0008] This invention aims at offering the approach of manufacturing the laminating porosity film which was excellent in the adhesion between layers, and was excellent in mechanical strengths, such as **** reinforcement, without crushing a hole, in view of the above-mentioned conventional situation.

[0009]

[Means for Solving the Problem] In order to attain said purpose, the manufacture approach of the porosity film of this invention The 1st means which carries out film shaping so that the rate of a birefringence after fabricating the molding material which makes thermoplastics a subject may become 0.003 or more, It is characterized by consisting of superposition, 2nd means to heat and unify, and 3rd means to carry out uniaxial stretching of this unified film, and to porosity-ize so that the direction of orientation may not become parallel substantially about at least two sheets of this film.

[0010] In said approach, it is desirable that it is the range of **20-degree C melting point of the resin which has the lowest melting point among the resin with which whenever [stoving temperature / of the 2nd means] constitutes the field as for which said film carries out a laminating. Moreover, in said approach, it is desirable that the include angle which the direction of orientation of the film which should be carried out a laminating intersects is within the limits of 10 degrees - 90 degrees. Moreover, in said approach, it is desirable that the include angle of the extension direction in uniaxial stretching and the orientation of each film is 5 degrees - 45 degrees. According to the configuration of above mentioned this invention, the adhesion force between layers is large, and it can manufacture, without crushing a hole for the laminating porosity film excellent in mechanical properties, such as ******-proof.

[0011]

[Embodiment of the Invention] Although especially the thermoplastics used in this invention is not limited, crystalline polymer or semicrystallinity resin is used and crystalline polymer, such as polypropylene, polyethylene, polybutene, Pori (4-methyl-pentene -1), and polyvinylidene fluoride, is preferably used also in them. Although these resin may be used alone, it may use as a copolymer, or two or more sorts may be blended and used.

[0012] In this invention, melting kneading of the constituent obtained by the above-mentioned thermoplastics by carrying out optimum dose combination of the additives, such as an antioxidant, an antistatic agent, a slipping agent, a nucleating agent, and a bulking agent, if needed further is carried out with a twin screw extruder, a kneader, a roll, a Banbury mixer, etc., and, subsequently to the shape of a film, melting shaping is carried out by T-die extrusion molding, inflation molding, etc.

[0013] Taking the structure (row structure) to which lamellae (plate crystal) made the train perpendicularly, and was located in a line with it to the direction of taking over of a film is known by fabricating crystalline polymer by high draft ratio (for example, H.S.Bierenbaum et al., Ind.Eng.Chem., Prod.Res.Develop.vol.13, No.1, P-2, (1974)).

[0014] If a crystal stacking tendency is extremely low, in the extension process performed behind, it will not porosity-ize enough. Therefore, on the occasion of film shaping in this invention, it is necessary to fabricate by high draft ratio and to work the rate of a birefringence of the obtained film 0.003 or more on conditions which become 0.005 or more more preferably. In addition, although 0.03 or less are usually desirable from a viewpoint of a film moldability as for this rate of a birefringence, it is not limited especially about an upper limit.

[0015] In addition, although there were an approach of measuring a refractive index from a 2-way, using an Abbe refractometer as a measuring method of the rate of a birefringence, and computing from the difference, an approach using a compensator, etc., the value measured in this invention using the automatic birefringence meter (COBRA-21C; Kanzaki Paper Mfg. Co., Ltd. make) was used.

[0016] Subsequently, laminating unification is carried out like the above by arranging and carrying out

heating pressurization so that the direction of orientation may not become parallel, using the orientation nonvesicular film which obtained by carrying out at least two sheets. The presentation of a film which carries out a laminating, a configuration, and its combination are chosen according to the final purpose. Therefore, the laminating of the film of the quality of the material which could completely carry out the laminating of the homogeneous film, and is different may be carried out. Moreover, two or more sheet laminating of the film beforehand fabricated to multilayer structure may be carried out.
[0017] Instantiation of the case where the laminating of the homogeneous film is carried out mentions the laminating of polyethylene simple substance films, the laminating of the blend films of polyethylene and polypropylene, the laminating of the blend films of polyethylene and polybutene, etc.
[0018] Moreover, as a laminating of the film of the different quality of the material, the laminating of the blend film of polyethylene and polypropylene, a laminating with a polypropylene simple substance film and the blend film of polyethylene and polypropylene, and a polyethylene simple substance film etc. is mentioned.
[0019] The laminating of the films by three-layer co-extrusion shaping which made the outer layer the laminating of the films by two-layer co-extrusion shaping with polypropylene and polyethylene and the blend layer of polyethylene and polypropylene as two or more sheet laminating of the film beforehand fabricated to multilayer structure, and made polypropylene the inner layer etc. is mentioned.
[0020] Although especially laminating number of sheets is not limited above two-layer, they are usually about 50 layers from two-layer. A mechanical strength becomes good so that there is much laminating number of sheets, but since the thickness of the film in front of a laminating becomes thin on the other hand, actuation becomes difficult. As thickness of a film, 1-100 micrometers is desirable.
[0021] In this invention, although it piles up so that the film more than two-layer may not become parallel, as for the include angle which the direction of orientation of the film by which a laminating is carried out intersects, it is desirable that all films are within the limits of 10 degrees - 90 degrees, and especially its thing in within the limits which is 30 degrees - 60 degrees is desirable.
[0022] In addition, as for the include angle which the two directions of orientation intersect, although two kinds of include angles for the angle used as the angle and the supplementary angle of an angle of arbitration exist, the crossed axes angle in this invention says the include angle corresponding to the part in which the extension direction exists to four parts divided by two straight lines expressing the extension direction which crossed on the flat surface. Extension porosity-ization will become difficult if a mechanical strength is small when this include angle is too small, and this include angle is too large.
[0023] The approach of piling up two or more sheets so that it may become a specific crossed axes angle about a strip-of-paper-like oriented film, although not limited especially about the method of realizing such a crossover include angle, the method of cutting the film which extruded by inflation molding in the shape of a spiral, producing the film which carried out orientation aslant to the longitudinal direction, and piling up two or more [of these] so that the direction of orientation may cross, etc. are mentioned.
[0024] As for the temperature which carries out a laminating, it is desirable to carry out with the melting point of **20 degrees C of the resin which has the lowest melting point among the resin which constitutes a film. If the temperature which carries out a laminating is too low, the welding of a film will become inadequate, it will separate at the time of extension, or the mechanical strength of the porosity film after extension will become low. Moreover, when this temperature is too high, the crystal stacking tendency of a film falls extremely and it becomes inadequate porosity-izing it in a next extension process. The crystal stacking tendency is maintained also in temperature higher about 20 degrees C than the melting point of the resin with which it has the melting point lowest when using two or more sorts of resin although the temperature to which a crystal stacking tendency falls extremely is usually near the melting point. Although this reason is not clear, when the low-melt point point resin probably fused once grows epitaxially to the crystal structure of high-melting resin, it is thought that that crystal stacking tendency is maintained.
[0025] When carrying out a blend or a laminating and using two or more sorts of resin, especially the temperature that carries out a laminating to a porosity film like a demarcation membrane or the separator

for cells when permeability is required has meaning in being based on the lowest melting point among the melting points which the resin which constitutes a film has. The porosity film which the resin put to the elevated temperature to which the reason exceeded 20 degrees C or more of melting points loses orientation, and does not porosity-ize it in a next extension process, consequently is finally obtained is because it does not have permeability. Therefore, as for the resin which has the lowest melting point, arranging to the field by which a laminating is carried out is desirable. With such arrangement, the best welding is obtained at the lowest laminating temperature.
[0026] Moreover, since the approach of this invention carries out the laminating of the nonvesicular film, the structure is not destroyed even if it puts a pressure at the time of a laminating. Therefore, the usual lamination roll can be used and also the approach using heated metal plates, such as a press, etc. is employable.
[0027] To the film obtained by carrying out a laminating as mentioned above, as long as it is required, you may heat-treat. By heat-treating, the crystallinity of this laminated film can be raised, formation of the micropore in the extension process performed behind is promoted, and the porosity film of high porosity can be obtained.
[0028] In the approach of this invention, extension porosity is formed for the first time after the above-mentioned laminating unification process. The roll type extension known from the former can perform the extension approach.
[0029] As for the include angle at which the extension direction and the direction of orientation of each film make the extension direction in this extension process, it is desirable that it is within the limits of 5 degrees - 45 degrees, and especially the thing in within the limits which is 15 degrees - 30 degrees is desirable.
[0030] Since exfoliation between the crystal lamellaes of the nonvesicular film which carried out orientation crystallization will not be efficiently performed if this include angle is too large, porosity-ization becomes difficult. In order to make into the above-mentioned range the include angle which the extension direction and the direction of orientation of a film make, it is desirable to extend in the direction which shows one half of include angles to the maximum include angle in the include angle which makes the direction of orientation of each film.
[0031] Extension is performed at -20 degrees C - 60 degrees C ("extension at -20 degrees C - 60 degrees C" is hereafter called cold drawing). If extension temperature is too low, it will be easy to produce fracture of a film during an activity, and it will porosity-be hard toize if too high. Although the rate of extension at this time is not limited, it is usually preferably made into 50 - 300% 20 to 400%. In addition, this rate of extension (M1%) is expressed by the following formula (1). L0 in a formula (1) The dimension in front of cold drawing, and L1 It is a dimension after cold drawing.
[0032]
[Equation 1]
$$M_1 = \{(L_1 - L_0)/L_0\} \times 100$$

[0033] In this invention, although it is not especially limited after carrying out cold drawing like the above, you may extend again at the temperature below the lowest melting point of the resin (constituent) which accomplishes this film above 60 degrees C ("elevated-temperature extension" is called hereafter). If too high [if the temperature at the time of this extension is too low, it will become easy to produce fracture of a film, and], since the porosity of a porosity film will be lost, usually extending at the above-mentioned temperature is desirable.
[0034] In addition, although especially the rate of extension at the time of elevated-temperature extension is not limited, it is usually 10 - 500%. This rate of extension (M2 %) is expressed by the following formula (2). L2 in a formula (2) The dimension after performing elevated-temperature extension, and L1 It is a dimension before elevated-temperature extension (dimension after cold drawing). Moreover, this elevated-temperature extension may be performed over multistage.
[0035]
[Equation 2]

$$M_2 = \{(L_2 - L_1)/L_0\} \times 100$$

[0036] Moreover, since the stress at the time of extension remains and a dimension tends to contract the porosity film obtained by performing an extension activity in the extension direction, dimensional stability is also improvable by carrying out the heat shrink of the dimension of the extension direction beforehand after extension. As for this heat shrink, it is desirable to carry out at the same temperature as extension temperature or the temperature beyond it. Usually let the degree which carries out a heat shrink be extent to which the film die length after extension decreases 10 to 40%.
[0037] In addition, dimensional stability is improvable the same with performing the above-mentioned heat shrink processing also by regulating so that the dimension of the extension direction in a porosity film may not change, and performing the so-called "heat setting" heated at extension temperature or the temperature beyond it. Furthermore, it can also use combining a heat shrink and a heat setting.
[0038]
[Example] Although an example explains this invention concretely below, this invention is not limited to these examples.
[0039] Permeability and **** reinforcement were measured by the approach shown below.
(Porosity) JIS K8117 -- applying correspondingly -- the Yasuda energy -- machine factory Gurley style Denso meter No.323-Auto -- using -- film surface product 642mm2 The time amount which ten cc of air passes was measured, and this value was doubled ten and calculated. Since it is the time amount taken for the air of unit volume to penetrate, it is shown that permeability is so good that this value is small.
[0040] (**** reinforcement) Using handy compression tester KES-G5 by the KATO tech company, the diameter of 1.0mm of a needle and the tip configuration R measured on condition that 0.5mm, 11.3mm of diameters of an electrode holder, and pushing rate 2 mm/min, and maximum load in case the film is torn was made into **** reinforcement (needle penetration reinforcement).
[0041]
[Example 1] The high density polyethylene of the melting point of 132 degrees C and a melt index ("MI" is called hereafter) 0.3 was fabricated on the dice temperature of 220 degrees C, and the conditions of draft ratio 40 in the shape of a long film with the T-die extruder. The obtained film-like objects were 20 micrometers in thickness, and the rate 0.032 of a birefringence. Using this film two sheets, piled up so that a crossover include angle might become 60 degrees, and it was made to contact for 30 seconds at the temperature of 124 degrees C with a hot calender roll, and laminating unification was carried out.

Same films heated

[0042] Subsequently, cold drawing of this laminating nonvesicular film was carried out so that the rate of extension might become 50% at the temperature of 25 degrees C in the abbreviation 2 division-into-equal-parts direction of a crossed axes angle, and elevated-temperature extension was carried out so that the rate of extension might become 150% in this direction at 110 more degrees C. Then, it regulated so that the dimension of the extension direction might not change, and at 110 degrees C, it heated for 2 minutes and the heat setting was carried out. The thickness of the obtained laminating porosity film was 27 micrometers.
[0043] About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.
[0044]
[Example 2] Except for the point which made the crossover include angle 30 degrees in the laminating of a nonvesicular film, the laminating porosity film was obtained like the example 1. The thickness of the obtained laminated film was 28 micrometers. About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.
[0045]
[Example 3] Except for the point piled up three sheets so that three crossover include angles might become -45 degrees, 0 degree, and 45 degrees from a top to the extension direction using a nonvesicular film, the laminating porosity film was obtained like the example 1. The thickness of the obtained

laminating porosity film was 41 micrometers. About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.

[0046]

[Example 4] Melting mixing of the melting point of 166 degrees C, the isotactic polypropylene 60 weight section of MI2.5, and the melting point of 137 degrees C and the high-density-polyethylene 40 weight section of MI0.75 was carried out, and it fabricated on the dice temperature of 240 degrees C, and the conditions of draft ratio 80 in the shape of a long film with the T-die extruder. The thickness of the obtained film-like object was 22 micrometers and the rate 0.009 of a birefringence. This film was contacted for 30 seconds at the temperature of 147 degrees C using two-sheet superposition and a hot calender roll so that a crossover include angle might become 90 degrees, and laminating unification was carried out.

diff film louder

[0047] Subsequently, cold drawing of this laminating nonvesicular film was carried out so that the rate of extension might become 100% at the temperature of 25 degrees C in the abbreviation 2 division-into-equal-parts direction of a crossover include angle, and elevated-temperature extension was carried out so that the rate of extension might become 200% in this direction at 105 more degrees C. Furthermore, it regulated so that the dimension of the extension direction might not change, and at 105 degrees C, it heated for 2 minutes and the heat setting was carried out. The thickness of the obtained laminating porosity film was 26 micrometers.

[0048] About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.

[0049]

[Example 5] Inflation co-extrusion shaping was performed by the extrusion temperature of 220 degrees C, and the blow ratio 1.2, and the film of the shape of a tube of a three-tiered structure was obtained so that an outer layer might serve as mixture of the melting point of 167 degrees C, the isotactic polypropylene 10 weight section of MI0.4, and the melting point of 132 degrees C and the high-density-polyethylene 90 weight section of a melt index 0.75 and the middle class might become the melting point of 167 degrees C, and the isotactic polypropylene simple substance of MI0.4. 11 micrometers in 21 micrometers in the total thickness and interlayer thickness and an outer layer were 5 micrometers each, and the obtained nonvesicular film was the rate 0.014 of a birefringence.

[0050] This tube-like film was cut in the shape of a spiral, and the nonvesicular film of the shape of a long picture which makes the include angle whose direction of orientation is 30 degrees to a longitudinal direction was obtained. Using this film two sheets, it has arranged so that the direction of orientation may cross, and the long picture-like nonvesicular laminated film whose crossed axes angle is 60 degrees was obtained using the hot calender roll by making it contact for 30 seconds at 124 degrees C, and carrying out a laminating.

[0051] Subsequently, cold drawing of this long picture-like laminating nonvesicular film was carried out so that the rate of extension might become 40% at the temperature of 25 degrees C in the abbreviation 2 division-into-equal-parts direction of a crossover include angle, and elevated-temperature extension was carried out so that the rate of extension might become 160% in this direction at 105 more degrees C. Furthermore, it regulated so that the dimension of the extension direction might not change, and at 105 degrees C, it heated for 2 minutes and the heat setting was carried out. The thickness of the obtained long picture-like laminating porosity film was 27 micrometers.

[0052] About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.

[0053]

[The example 1 of a comparison] Except for the point that the crossover include angle which the two-layer direction of orientation makes is 0 degree, the laminating porosity film was obtained like the example 1. The thickness of the obtained laminating porosity film was 28 micrometers. About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.

[0054]
[The example 2 of a comparison] It fabricated on the dice temperature of 220 degrees C, and the conditions of draft ratio 40 in the shape of a long film with the T-die extruder using the high density polyethylene used in the example 1. The obtained film-like objects were 40 micrometers in thickness, and the rate 0.025 of a birefringence. Subsequently, one sheet was extended on the same conditions as an example 1 in the direction of orientation using this nonvesicular film. The thickness of the obtained porosity film was 28 micrometers. About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.
[0055]
[The example 3 of a comparison] Using the nonvesicular film of 20 micrometers in thickness, and the rate 0.032 of a birefringence obtained in the example 1 one sheet, the hot calender roll was made to contact and 124 degrees C was heat-treated for 30 seconds. Cold drawing of this film was carried out so that the rate of extension might become 50% in the direction of orientation at the temperature of 25 degrees C, and elevated-temperature extension was carried out so that the rate of extension might become 150% in this direction at 110 more degrees C. Then, it regulated so that the dimension of the extension direction might not change, and at 110 degrees C, it heated for 2 minutes and the heat setting was carried out.
[0056] Subsequently, although it was going to pile up so that a crossover include angle might become 60 degrees, and it tended to be made to contact for 30 seconds at the temperature of 120 degrees C with a hot calender roll and it was going to carry out laminating unification, using the obtained porosity film two sheets, adhesion between sufficient layers was not obtained. Thickness was 28 micrometers.
[0057] About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.
[0058]
[The example 4 of a comparison] Except for the temperature at the time of the laminating of a porosity film being 133 degrees C, the laminating porosity film was obtained like the example 3 of a comparison. The thickness of the obtained laminating porosity film was 20 micrometers. About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.
[0059]
[The example 5 of a comparison] Except for the point which all of the direction of orientation of three layers piled up in the extension direction and this direction, the laminating porosity film was obtained like the example 3. The thickness of the obtained laminating porosity film was 42 micrometers. About the obtained laminating porosity film, the result of having measured permeability (the number of the Gurley seconds) and **** reinforcement is shown in Table 1.
[0060]
[Table 1]

	材　料	積層方法			多孔質フィルム物性		
		積層枚数	積層時期	延伸方向に対する配向方向	厚さ(μm)	突刺強度(gf)	通気度(sec/100ml)
実施例1	ＰＥ	2	延伸前	−30°，30°	27	590	611
実施例2	ＰＥ	2	延伸前	−15°，15°	28	541	609
実施例3	ＰＥ	3	延伸前	−45°，0°，45°	41	1297	945
実施例4	ＰＰ／ＰＥブレンド	2	延伸前	−45°，45°	26	601	624
実施例5	外層：ＰＰ／ＰＥブレンド 内層：ＰＰ	2	延伸前	−30°，30°	27	582	705
比較例1	ＰＥ	2	延伸前	0°，0°	28	347	607
比較例2	ＰＥ	1	−	0°	28	364	581
比較例3	ＰＥ	2	延伸後	−30°，30°	28	374	1209
比較例4	ＰＥ	2	延伸後	−30°，30°	20	586	∞
比較例5	ＰＥ	3	延伸前	0°，0°，0°	42	504	952

[0061] it has checked that the porosity film of the property which was markedly alike and was superior to the above-mentioned result as compared with the approach shown in the examples 1-5 of a comparison by carrying out the intersection product layer of the direction of orientation of the film fabricated beforehand in the specific direction, and forming it into extension porosity after that as shown in the examples 1-5 of this invention was obtained.

[0062]

[Effect of the Invention] As mentioned above, film shaping is carried out so that the rate of a birefringence after fabricating the molding material which makes thermoplastics a subject according to the approach of this invention may become 0.003 or more. Since a laminating is carried out before each class is formed into extension porosity superposition and by heating, unifying, carrying out uniaxial stretching of this film, and porosity-izing it so that the direction of orientation may not become parallel substantially about at least two sheets of said film, a hole is not blockaded at the time of a laminating. Moreover, since the adhesion between layers is large enough, the porosity film excellent in mechanical properties including **** reinforcement is producible.

[Translation done.]